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(54) Correcting for disc eccentricity in a disc drive

(57) An optical disc drive has an eccentricity correction device for correcting the eccentricity of a disc 1 loaded on a turntable. A central ring 26 supports the disc and is installed on the turntable to move the disc 1 loaded on the turntable by a predetermined distance from the center of rotation of the turntable when the central ring 26 is moved by a moving means 40. The central ring 26 also includes means (30, fig 5) to raise the disc clamp before the disc is moved. Therefore, the eccentricity of the disc can be precisely corrected, and, when a pickup records or reproduces information, the time for tracking can be sharply reduced and tracking errors can be prevented.

FIG.3

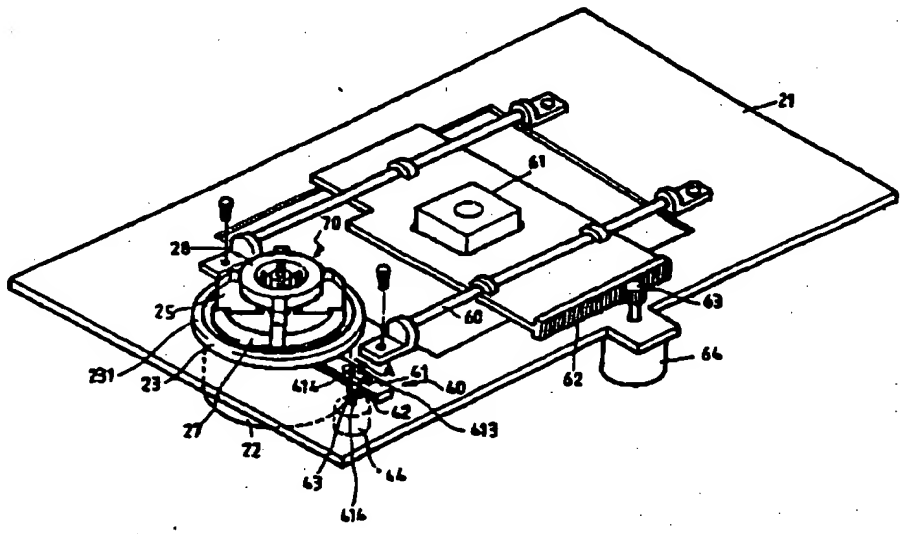

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FIG.1(PRIOR ART)

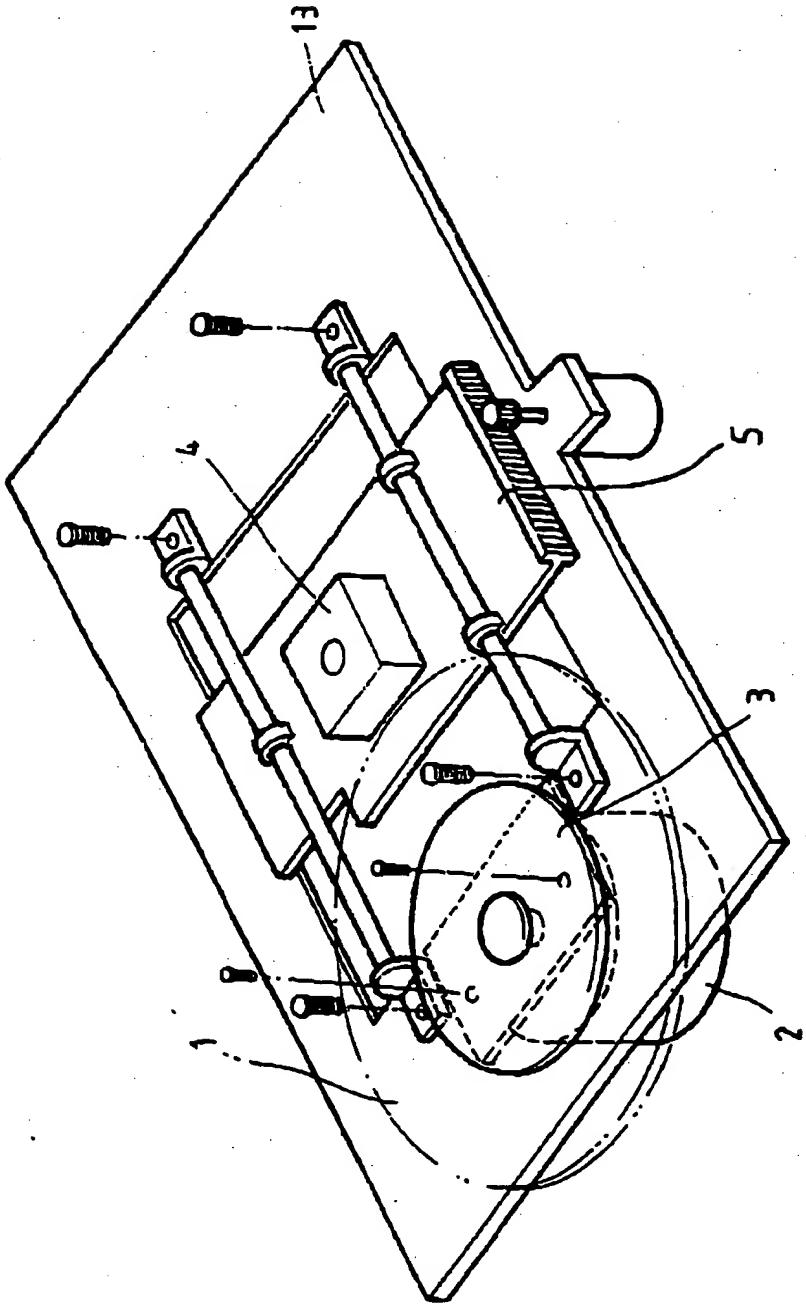


FIG.2(PRIOR ART)

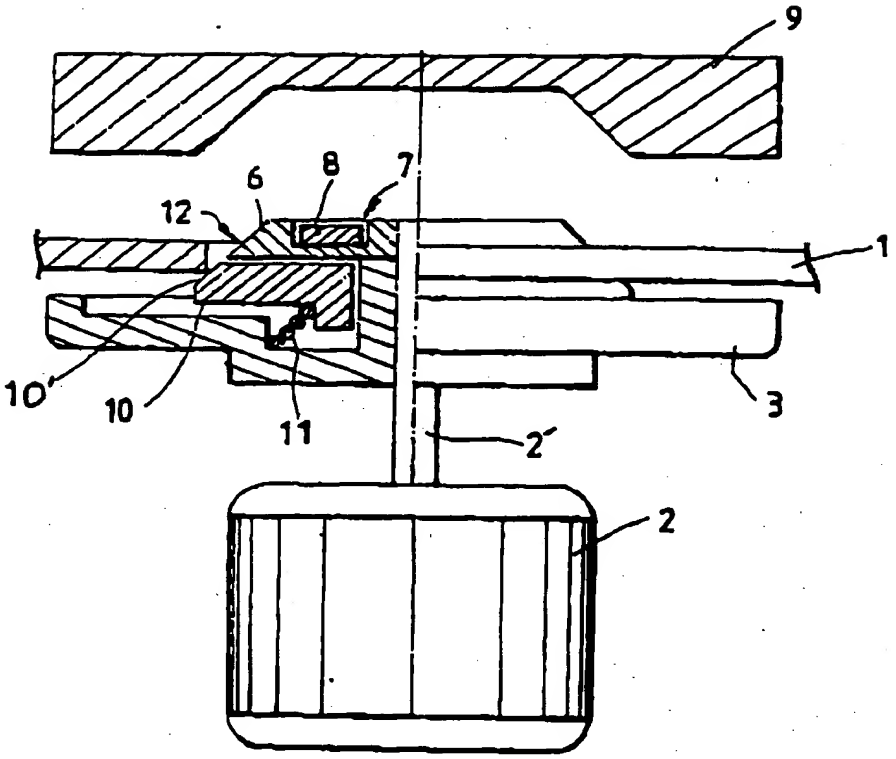


FIG.3

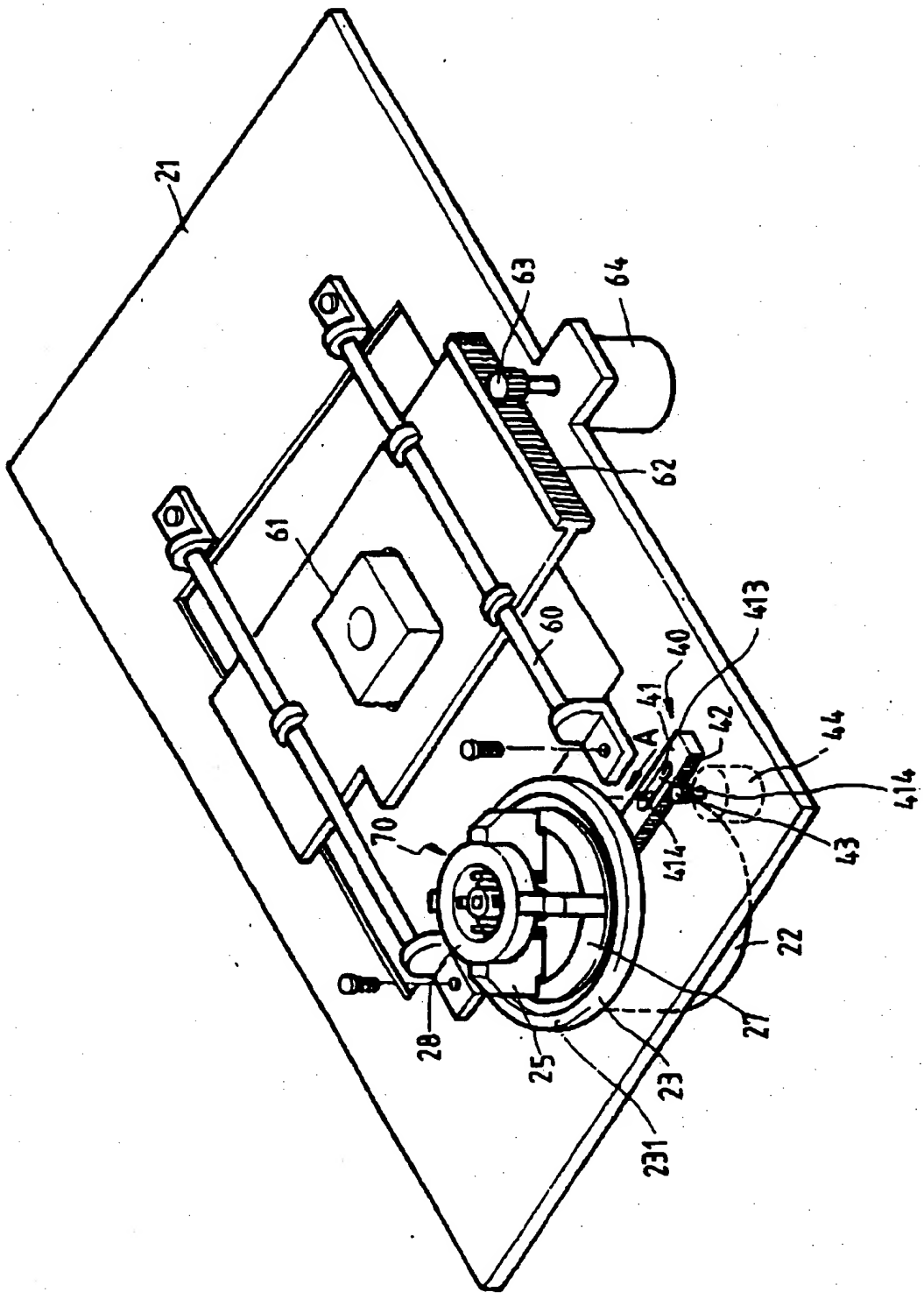


FIG.4

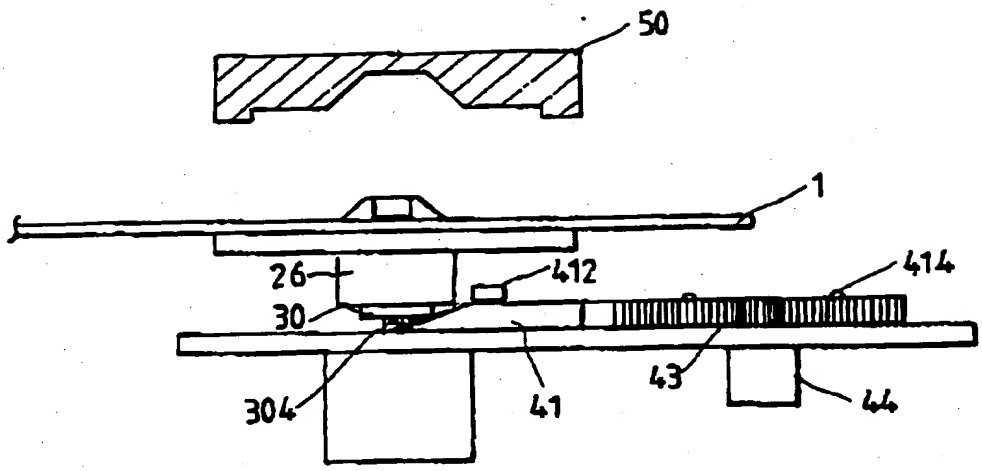


FIG.5

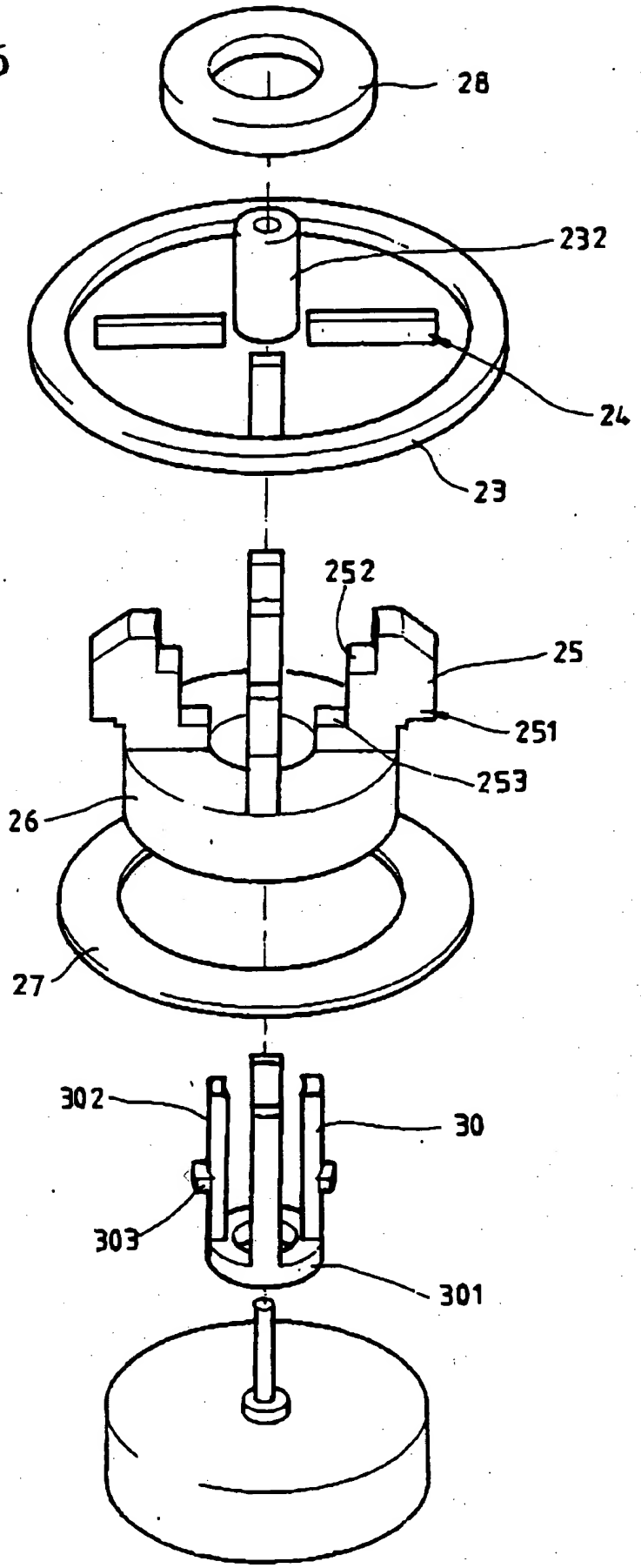


FIG.6

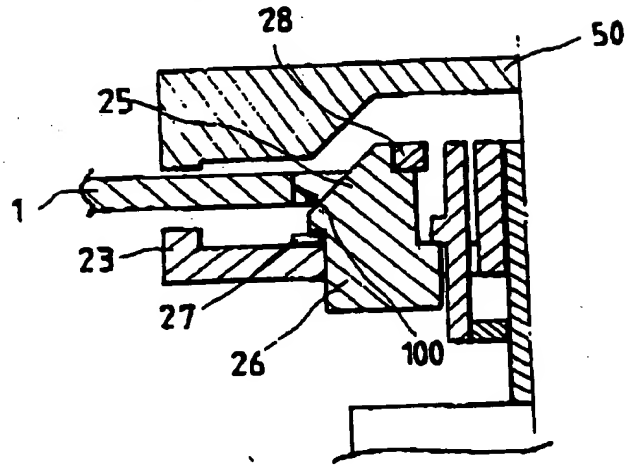


FIG.7

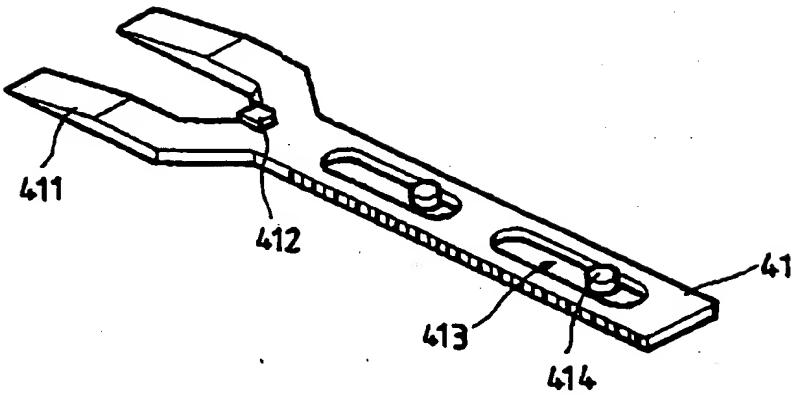


FIG.8

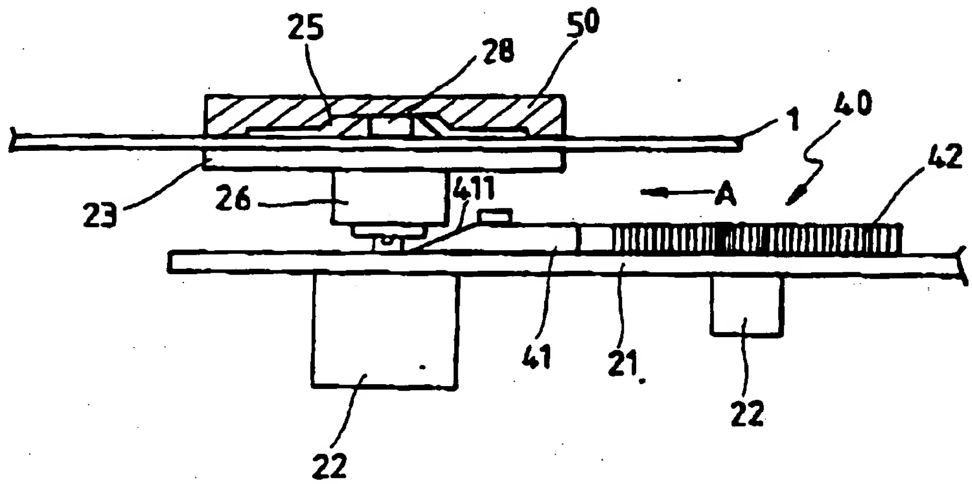


FIG.9

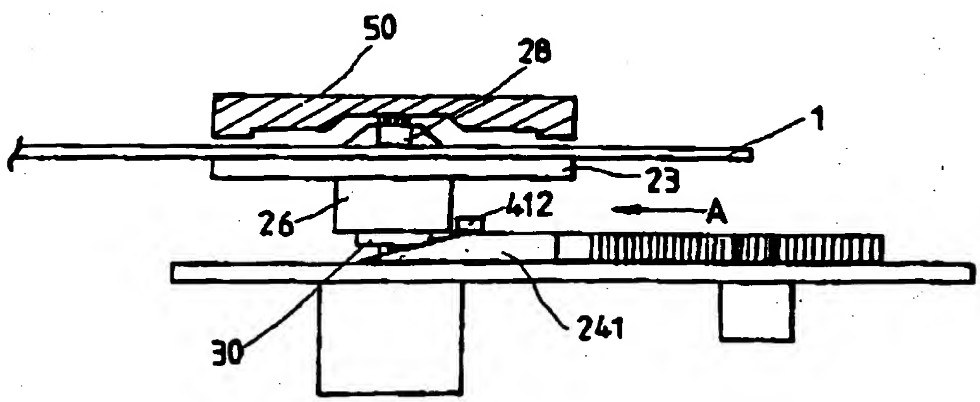


FIG.10

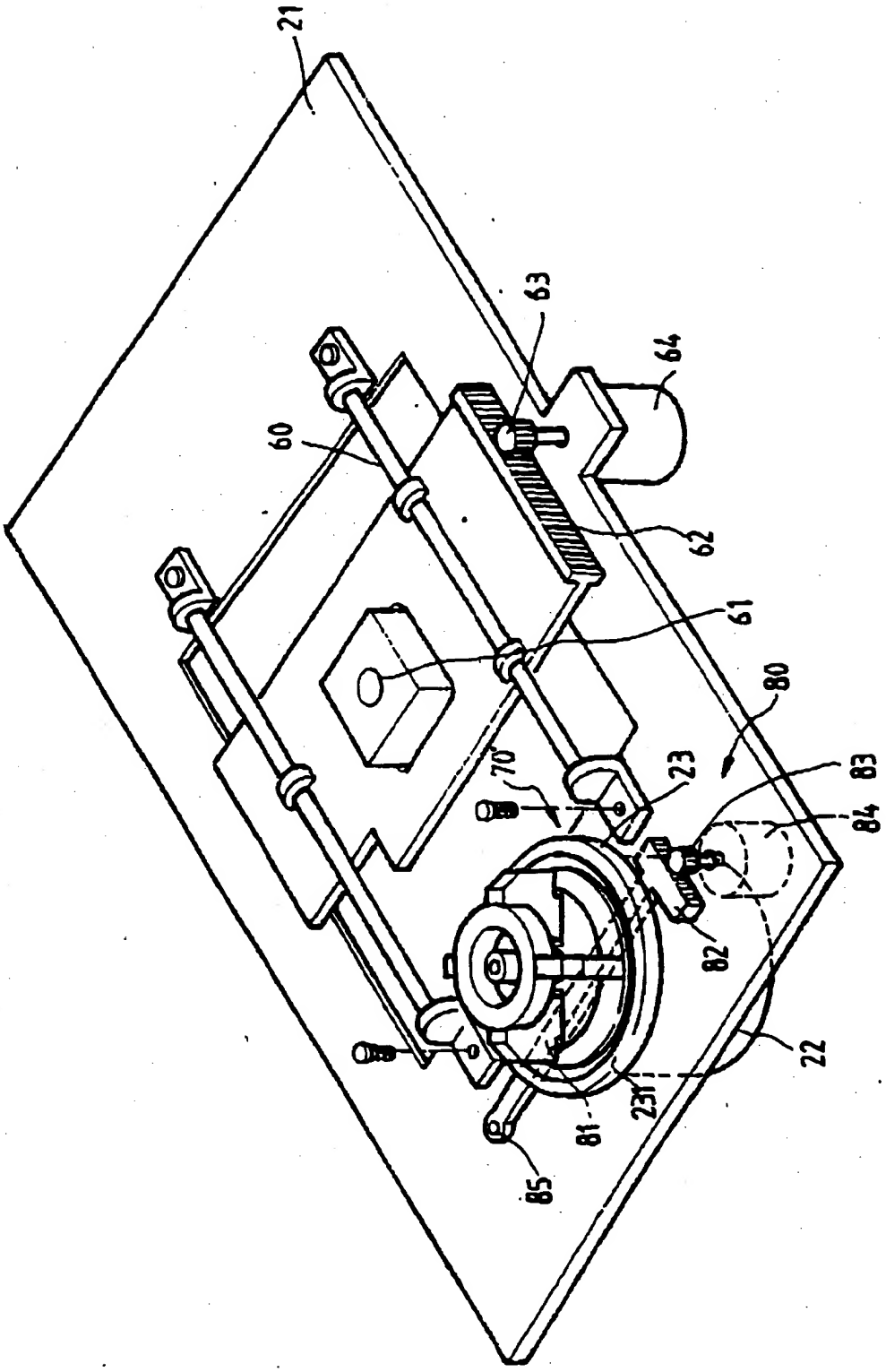


FIG.11

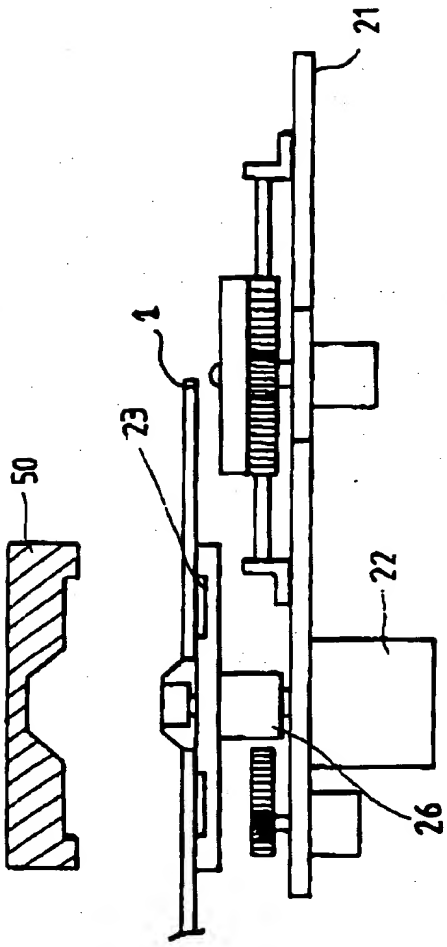


FIG.12

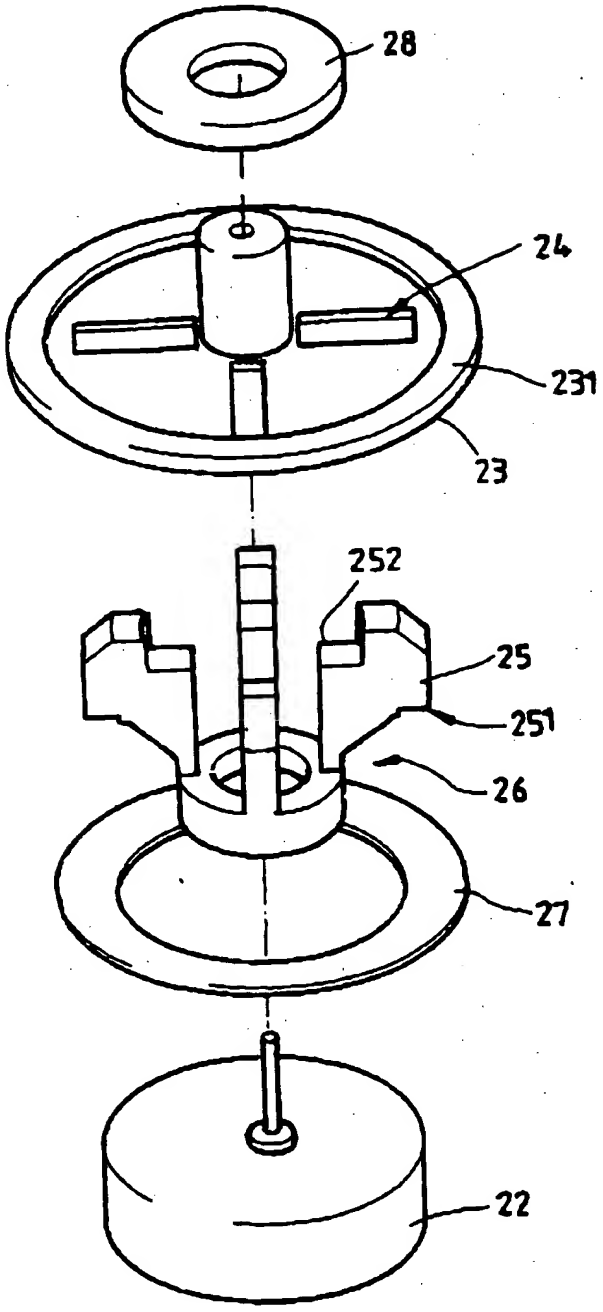
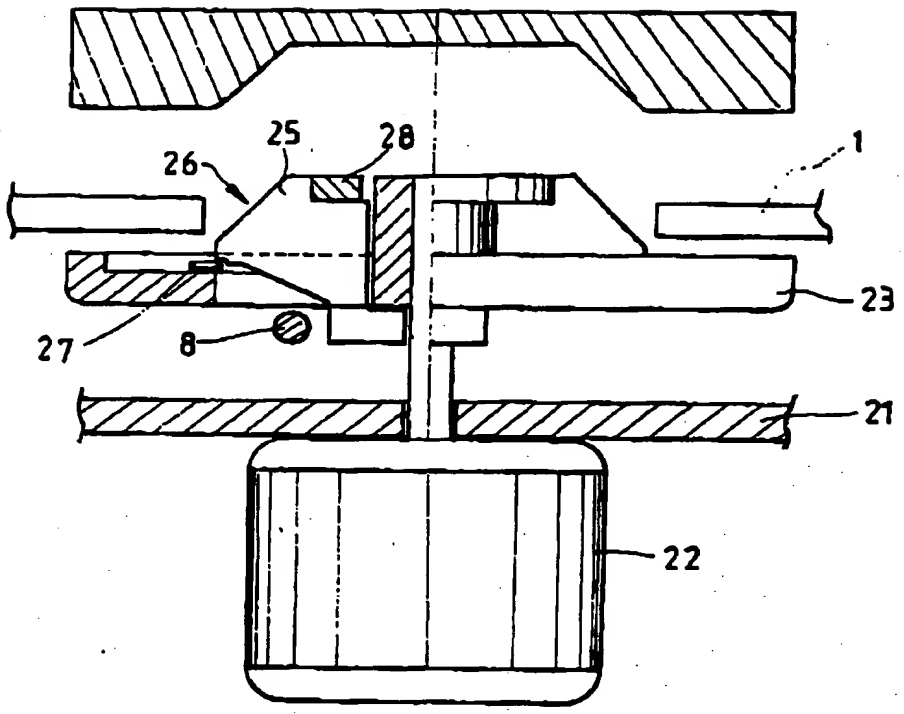


FIG.13



DISK DRIVE

The present invention relates to a disk drive, and more particularly, though not exclusively, to a disk drive equipped with a correction device for correcting the eccentricity of a rotating disk.

A general disk drive, such as a laser disk drive using a laser disk, a compact disk drive using a compact disk, and a magneto-optical disk drive, is known with a pickup for projecting a light beam onto a rotating disk, and receiving the light beam reflected from the disk to record or reproduce data onto the disk.

Referring to Figure 1 of the drawings that follow, in a conventional disk drive, a disk 1 is loaded on a turntable 3 coupled to the rotating axis of a spindle motor 2 fixed to a deck 13. A pickup 4 for projecting a laser beam onto the disk 1 and receiving the reflected beam therefrom is moved in a radial direction of the disk 1 by a pickup transferring means 5.

The pickup 4 scans the tracks of the disk 1 with the laser beam and reads or writes information thereon. When recording onto the disk 1, the tracks must be formed in a consistent manner in the radial direction from the center of the disk 1. If the disk 1 loaded on the turntable 3 rotates off center, the tracks are also formed in an eccentric manner on the disk 1. Also, the information on the disk 1 having eccentric tracks is difficult to reproduce in another normal disk drive. Generally, tracking coils (not shown) provided in the pickup 4 can correct this eccentricity, or the pickup transferring means 5 can correct the eccentricity by moving the pickup 4 in the radial direction of the disk 1. However, if the

eccentricity exceeds the allowable error, such solutions are not effective, thereby making reproduction impossible.

Figure 2 of the drawings that follow is a partly sectional view showing a portion of an eccentricity correction device used in the conventional disk drive of Figure 1. Here, the turntable 3 is fixedly attached to the axis 2' of the spindle motor 2 onto which a stop ring 6 is coupled. On the upper surface of the stop ring 6, a circular groove 7 is formed, and a magnet 8 attracts a clamp 9 magnetically for securing the disk 1 onto the turntable 3 after the disk 1 is loaded on the turntable 3. Also, a central ring 10 and a spring 11 under the central ring 10 are installed between the turntable 3 and the stop ring 6 to allow up and down movements thereof. At this time, the radius at the lower portion of the stop ring 6 is smaller than the radius of the center hole on the disk 1. The radius of the central ring 10 at its widest portion is larger than the radius of the center hole on the disk 1.

The conventional disk drive having such a configuration operates as follows. The disk 1 on an unshown tray is moved onto the turntable 3 in a well known manner, and the deck 13 (Figure 1) and the turntable 3 are moved upward. As the turntable 3 moves upward, the leading end of the stop ring 6 passes through the center hole of the disk 1, and the sloped surface 10' of the central ring 10 contacts and supports the disk 1. As the disk 1 gets situated on the sloped surface 10', the eccentricity of the disk 1 is corrected. Also, as the turntable 3 moves upward, the disk 1 comes into contact with the clamp 9. When the disk 1 contacts the clamp 9, the magnet 8 in the stop ring 6 attracts the clamp 9 due

to its magnetic force, thereby the disk 1 is secured onto the turntable 3.

In the disk drive having the eccentricity correction device as described above, the eccentricity of the disk 1 is corrected by the sloped surface 10' formed on the central ring 10. However, the central ring 10 may be off-center as it moves upward and downward between the turntable 3 and stop ring 6. If the central ring 10 is eccentric by 0.1mm, the disk 1 having a track interval of 1.6μm and rotating on the turntable 3 is eccentric by 625 tracks. Therefore, the pickup 4 (Figure 1) records information on other tracks instead of predetermined tracks, tracking takes longer during reproduction, or the information on the predetermined tracks cannot be reproduced.

It is an aim of preferred embodiments of the present invention to provide a disk drive having an eccentricity correction device which can precisely correct the eccentricity of a disk.

According to the present invention, there is provided a disk drive comprising: a turntable attached to the shaft of a spindle motor installed on a base frame, for loading a disk thereon; a clamp for securing the disk onto said turntable; a disk moving portion for supporting the disk by being inserted into a center hole of the disk, and moving the disk by a predetermined distance in a horizontal direction with respect to the disk from the center of rotation of said turntable; lifting means for lifting said clamp and releasing the disk loaded on said turntable; and moving means installed on the base frame, for lifting said lifting means and moving said disk moving portion by a predetermined distance.

It is preferable that the turntable has a plurality of holes symmetrically formed thereon, and said disk moving portion comprises a central ring interlocking with said moving means and moving horizontally by a predetermined distance from the center of rotation of said turntable, and a plurality of protrusions formed on said central ring for supporting the disk by passing through said holes on said turntable and inserting into the center hole of the disk.

Suitably, a magnet is installed on said protrusions for magnetically attracting said clamp and securing the disk onto said turntable.

Suitably, the disk drive further comprises a ring for supporting said disk moving portion so that said moving portion can move by a predetermined distance on said turntable.

Also, it is preferable that the lifting means comprises a pushing ring interlocking with said moving means, and a plurality of pushing rods formed on said pushing ring such that said pushing rods pass through said holes of said turntable, for pushing said clamp up when said pushing ring is lifted by said moving means.

Suitably, said pushing rods have at least one pushing protrusion formed thereon, and a step is formed on said protrusion for supporting said lifting means by having said pushing protrusion contact the upper surface of said step.

Suitably, said lifting means comprises a pushing ring interlocking with said moving means, and a plurality of pushing rods formed on said pushing ring such that said

pushing rods pass through said holes of said turntable, for pushing said clamp up when said pushing ring is lifted by said moving means.

It is preferable that the moving means comprises a moving rod on which a sloped surface for contacting and lifting said lifting means is formed at one end and on which a protrusion for contacting and horizontally moving said disk moving portion is formed, and driving means for moving said moving rod.

Suitably, said driving means comprises a rack formed on the side of said moving rod, a pinion engaged with said rack, and a motor for combining with said pinion and rotating said pinion.

Suitably, said lifting means includes a pushing ring ascending and descending by sliding on said sloped surface, and pushing rods formed on said pushing ring, and wherein said pushing ring and said pushing rod are lifted as said moving means rectilinearly move and said pushing rod pushes said clamp to thereby release the disk, and said protrusion of said pushing rod moves said disk moving portion by a predetermined distance to correct the eccentricity of said disk.

According to another aspect of the present invention, there is provided a disk drive comprising: a turntable attached to the shaft of a spindle motor installed on a base frame, for loading a disk thereon; a clamp for securing the disk onto said turntable; a disk moving portion for supporting the disk by being inserted into a center hole of the disk, and moving the disk by a predetermined distance in a horizontal direction with respect to the disk from the center of rotation of said

turntable; moving means for moving said disk moving portion by a predetermined distance.

It is preferable that the turntable has a plurality of holes symmetrically formed thereon, and said disk moving portion comprises a central ring interlocking with the moving means and moving horizontally by a predetermined distance from the center of rotation of said turntable, and a plurality of protrusions formed on said central ring for supporting the disk by passing through said holes on said turntable and inserting into the center hole of the disk.

Suitably, a magnet is installed on said protrusions for magnetically attracting said clamp and securing the disk onto said turntable.

Suitably, the disk drive further comprises a ring for supporting said disk moving portion so that said moving portion can move by a predetermined distance on said turntable.

Also, preferably, the moving means comprises a lever hinged on the base frame at one end thereof by a hinge and a pivoting means installed at the other end of said lever, for pivoting said lever around said hinge, and said lever moves said disk moving portion horizontally. Suitably, said pivoting means comprises a rack formed at the edge opposite said hinge of said lever, a pinion engaged with said rack, and a motor for rotating said pinion.

According to a further aspect of the present invention, there is provided a disk drive comprising means to support and drive a disk, and means to move the disk to correct a detected eccentricity in the tracks of the disk.

Suitably, the disk drive further comprises any one or more of the features of the accompanying description, claims, abstract and/or drawings, in any combination.

The present invention having such components aims properly to correct the disk eccentricity on the turntable. Therefore, accurate tracking can be possible, thus preventing errors generated during recording and reproduction.

The present invention will become more apparent by describing in detail a preferred embodiment thereof, by way of example only, with reference to the attached drawings in which:

Figure 1 is a perspective view showing the essential parts of a conventional disk drive;

Figure 2 is a partial sectional view showing an eccentricity correction device in the disk drive of Figure 1;

Figure 3 is a perspective view showing the essential parts of a disk drive having an eccentricity correction device according to a first embodiment of the present invention;

Figure 4 is a side view of the disk drive of Figure 3;

Figure 5 is an exploded perspective view showing a disk moving portion of the eccentricity correction device in the disk drive of Figure 3;

Figure 6 is a sectional view showing the disk moving portion of Figure 5;

Figure 7 is a perspective view showing a moving rod in the disk drive of Figure 3;

Figure 8 is a side view showing the state of a disk loaded onto a turntable by a clamp in the disk drive of Figure 3;

Figure 9 is a side view showing the state of a clamp raised by a clamp pushing rod in the disk drive of Figure 3;

Figure 10 is a perspective view showing the essential parts of a disk drive having an eccentricity correction device according to a second embodiment of the present invention;

Figure 11 is a side view of the disk drive of Figure 10;

Figure 12 is an exploded perspective view showing a disk moving portion of the eccentricity correction device in the disk drive of Figure 10; and

Figure 13 is a sectional view showing the disk moving portion of Figure 12.

Hereinbelow, a preferred first embodiment of a disk drive having an eccentricity correction device according to the present invention will be described in detail with reference to Figures 3 through 9.

As shown in Figures 3 and 4, the disk drive having an eccentricity correction device according to the present invention includes a spindle motor 22 for rotating a disk 1, and a pickup 61 for recording or reproducing information by projecting laser beam onto the disk 1 and receiving the reflected beam.

The pickup 61 is moved in a radial direction of the disk 1 via pickup transferring means which includes two parallel guide rails 60 fixed on a base frame 21 and guiding the pickup 61 supported thereon. A rack 62 is formed on one side of the pickup 61. A pinion 63 engages with the rack 62. The pinion 63 is fixed on the shaft of a pickup transferring motor 64 which is attached to the base frame 21. Accordingly, the pickup 61 is moved in a radial direction of the turntable 23 along the guide rails 60 by the rotation of the pickup transferring motor 64.

The eccentricity of the disk 1 rotated by the spindle motor 22 is corrected by the eccentricity correction device. The eccentricity correction device comprises a disk moving portion 70 installed on the turntable 23 to move the rotating disk 1 by a distance corresponding to the disk eccentricity from the rotating center of the turntable 23, and moving means 40 installed on the base frame 21 to properly transfer the disk moving portion 70.

The disk moving portion 70 will be described with reference to Figures 3, 4, 5, and 6. The turntable 23 on which a plurality of holes 24 are symmetrically formed is fixedly attached to the shaft 22' of the spindle motor 22 installed on the base frame 21. A central ring 26 on which protrusions 25 with first, second, and third steps 251, 252, and 253 are formed, the protrusions 25

corresponding to the number of the holes 24, is installed between the turntable 23 and the spindle motor 22.

The protrusions 25 of the central ring 26 pass through the holes 24 of the turntable 23, and protrude higher than the upper surface 231 of the turntable 23. The central ring 26, to be described later, is installed so as to be movable by a predetermined distance from the rotating center of the turntable 23 via the moving means 40.

As shown in Figure 6, the protrusions 25 of the central ring 26 pass through a center hole 100 of the disk 1 such that the disk 1 loads on the turntable 23.

A ring 27 is installed between the first step 251 of the protrusion 25 and the upper surface 231 of the turntable 23. The ring 27 supports the central ring 26 to prevent the central ring 26 from contacting the base frame 21 (Figure 3). A magnet 28 is provided on the second step 252 of the protrusion 25. This magnet 28 attracts the clamp 50 (Figure 6) by magnetic force so that the disk 1 loaded on the turntable 23 is secured thereto.

A clamp pushing rod 30 is installed between a bush 232 of the turntable 23 and the central ring 26 so that up and down movements of the clamp pushing rod 30 is possible. The clamp pushing rod 30 comprises a rod 302 on which a pushing protrusion 303 is formed, and a pushing ring 301 on which the rod 302 is formed. When the moving means 40 (Figure 3) (to be described later) pushes the central ring 26, the clamp 50 is lifted by the clamp pushing rod 30, thereby releasing from the disk 1 loaded on the turntable 23.

The rod 302 passes through the holes 24 formed on the turntable 23. The clamp pushing rod 30 is supported by having the pushing protrusion 303 contact the upper surfaces of the third step 253 formed on the protrusions 25.

The moving means 40 will be described with reference to Figures 3, 4, and 7. The moving means 40 includes a moving rod 41 movably installed on the base frame 21 such that movements in the direction of arrow A (Figure 3) and in the opposite direction are possible, and driving means for moving the moving rod 41.

Sloped surfaces 411 (Figure 7), a protrusion 412, and slots 413 are formed on the moving rod 41. As the moving rod 41 moves in the direction of arrow A by the driving means, the sloped surfaces 411 contact and lift the clamp pushing rod 30 (Figure 4), and the protrusion 412 pushes and moves the central ring 26. Also, pins 414 fixed on the base frame 21 fit into the slots 413 (Figure 7), and thus guides the moving rod 41 so that the movement of the moving rod 41 is limited to the directions of arrow A and opposite arrow A.

The driving means of the moving means 40 includes a rack 42 (Figure 3) formed on the side of the moving rod 41, a pinion 43 engaged with the rack 42, and a motor 44 for rotating the pinion 43. The driving means moves the moving rod 41 in the direction of arrow A or in the opposite direction by a predetermined distance depending on the rotating direction of the motor 44.

The operation of the disk drive having an eccentricity correction device according to the present

invention constituted by the above components will be described with reference to Figures 8 and 9.

When the disk 1 is safely loaded on an unshown tray and placed onto the upper part of the turntable 23 shown in Figure 8, the base frame 21 and the turntable 23 ascend as in the conventional device.

As the turntable 23 is elevated, the protrusions 25 formed on the central ring 26 are inserted into the unshown center hole of the disk 1 so that the disk 1 is loaded on the turntable 23. As the turntable 23 continues to ascend, the disk 1 comes into contact with the clamp 50. The magnet 28 fixed on the central ring 26 attracts the clamp 50 so that the disk 1 fits securely onto the turntable 23. Subsequently, the pickup 61 (see Figure 3) projects a laser beam onto the tracks of the disk 1 and then reads the information recorded on the tracks, and also reads the extent of eccentricity of the tracks. An unshown controller calculates the extent of the eccentricity of the tracks, and stops the rotation of the spindle motor 22 to be located such that the eccentricity of the disk 1 can be compensated for by movement of the moving rod 41, for example, the eccentricity direction is parallel with the movement direction A of the moving rod 41 when the counted value exceeds an allowable error range. Here, the spindle motor 22 is suspended temporarily by the controller and located so that the eccentricity of the disk 1 can be compensated by moving the moving rod 41 in the direction of arrow A.

As the moving rod 41 is moved in the direction of arrow A by rotation of the motor 44, as shown in Figure 9, the clamp pushing rod 30 is pushed up by the sloped surfaces 411, and the clamp pushing rod 30 pushes the

clamp 50 attaching the disk 1 onto the turntable 23 up to thereby release the disk 1. Then, the protrusion 412 formed on the moving rod 41 pushes and moves the central ring 26 by a distance corresponding to the degree of eccentricity. At this time, since the disk 1 is not clamped by the clamp 50, the central ring 26 and the disk 1 can move freely, and the eccentricity error can be corrected.

A preferred second embodiment of a disk drive having an eccentricity correction device according to the present invention will be described in detail with reference to Figures 10 to 13. The same reference numerals as those of the previous drawings designate the same elements.

Referring to Figure 10, the disk drive having the eccentricity correction device according to this embodiment comprises pickup moving means for moving the pickup 61 along the radial direction of the disk 1 (see Figure 11), and an eccentricity correction device for correcting the eccentricity of the disk 1 rotated by the spindle motor 22.

The eccentricity correction device comprises a disk moving portion 70' installed on the turntable 23 to move the rotating disk 1 from the rotating center of the turntable 23 by a predetermined distance, and moving means 80 installed on the base frame 21 to appropriately move the disk moving portion 70'.

The disk moving portion 70' will be described with reference to Figures 10, 12, and 13. The turntable 23 on which a plurality of holes 24 are symmetrically formed is fixedly attached to the shaft 22' of the spindle motor 22 installed on the base frame 21. The central ring 26 on

which protrusions 25' having first and second steps 251' and 252' are formed is installed between the turntable 23 and the spindle motor 22. The protrusions 25' on the central ring 26 pass through the holes 24 on the turntable 23, and protrude higher than the upper surface 231 of the turntable 23. Also, the central ring 26, as described later, is installed so that it can be moved from the rotating center of the turntable 23 by a predetermined distance via the moving means 80.

The ring 27 for supporting the central ring 26 is installed between the first step 251' formed on the protrusions 25' and the upper surface 231 of the turntable 23, to prevent the central ring 26 from contacting the base frame 21.

The magnet 28 is disposed on the second step 252' of the protrusions 25' to secure the disk 1 loaded on the turntable 23 closely thereto by magnetically attracting the clamp 50 (Figure 13).

The moving means 80 will be described with reference to Figures 10 and 11. The moving means 80 includes a lever 81 connected at one end thereof to the base frame 21 by a hinge 85, and a pivoting means installed at the other end of the lever 81 for pivoting the lever 81 around the hinge 85 by a predetermined angle. The pivoting means includes a rack 82 formed on the other end of the lever 81, a pinion 83 engaged with the rack 82, and a motor 84 for rotating the pinion 83. This moving means 80 pivots the lever 81 in the direction of arrow B and in the opposite direction around the hinge 85 according to the rotating direction of the motor 84.

The disk drive having the eccentricity correction device according to the present invention with the components described above operates as follows.

In the same manner as that of the first embodiment, when the disk 1 is loaded on the turntable 23, the pickup 61 projects a laser beam onto the tracks of the disk 1, and then reads the degree of the eccentricity. Then, an unshown controller counts the degree of the eccentricity of the tracks. When the counted value exceeds the allowable error range, the controller stops the rotation of the spindle motor 22 to be located such that the eccentricity of the tracks can be compensated for by pivot movement of the lever 81, for example, the eccentricity direction is perpendicular to the lengthwise direction of the lever 81. Next, the motor 84 of the moving means 80 rotates and the lever 81 on which the rack 82 is formed pivots around the hinge 85 so that the eccentricity of the central ring 26 (see Figure 11) in the disk moving portion 70' is corrected.

A disk drive having an eccentricity correction device according to the described embodiments of the present invention properly corrects the eccentricity of a rotating disk so that accurate tracking is possible and errors generated when recording and reproducing can be prevented.

The reader's attention is directed to all papers and documents which are filed concurrently with or previous to this specification in connection with this application and which are open to public inspection with this specification, and the contents of all such papers and documents are incorporated herein by reference.

All of the features disclosed in this specification (including any accompanying claims, abstract and drawings), and/or all of the steps of any method or process so disclosed, may be combined in any combination, except combinations where at least some of such features and/or steps are mutually exclusive.

Each feature disclosed in this specification (including any accompanying claims, abstract and drawings), may be replaced by alternative features serving the same, equivalent or similar purpose, unless expressly stated otherwise. Thus, unless expressly stated otherwise, each feature disclosed is one example only of a generic series of equivalent or similar features.

The invention is not restricted to the details of the foregoing embodiment(s). The invention extends to any novel one, or any novel combination, of the features disclosed in this specification (including any accompanying claims, abstract and drawings), or to any novel one, or any novel combination, of the steps of any method or process so disclosed.

CLAIMS

1. A disk drive comprising:

a turntable attached to the shaft of a spindle motor installed on a base frame, for loading a disk thereon;

a clamp for securing the disk onto said turntable;

a disk moving portion for supporting the disk by being inserted into a center hole of the disk, and moving the disk by a predetermined distance in a horizontal direction with respect to the disk from the center of rotation of said turntable;

lifting means for lifting said clamp and releasing the disk loaded on said turntable; and

moving means installed on the base frame, for lifting said lifting means and moving said disk moving portion by a predetermined distance.

2. A disk drive as claimed in claim 1, wherein said turntable has a plurality of holes symmetrically formed thereon, and said disk moving portion comprises a central ring interlocking with said moving means and moving horizontally by a predetermined distance from the center of rotation of said turntable, and a plurality of protrusions formed on said central ring for supporting the disk by passing through said holes on said turntable and inserting into the center hole of the disk.

3. A disk drive as claimed in claim 2, wherein a magnet is installed on said protrusions for magnetically attracting said clamp and securing the disk onto said turntable.

4. A disk drive as claimed in claim 2 or claim 3, further comprising a ring for supporting said disk moving portion so that said moving portion can move by a predetermined distance on said turntable.

5. A disk drive as claimed in any one of claims 2-4, wherein said lifting means comprises a pushing ring interlocking with said moving means, and a plurality of pushing rods formed on said pushing ring such that said pushing rods pass through said holes of said turntable, for pushing said clamp up when said pushing ring is lifted by said moving means.

6. A disk drive as claimed in claim 5, wherein said pushing rods have at least one pushing protrusion formed thereon, and a step is formed on said protrusion for supporting said lifting means by having said pushing protrusion contact the upper surface of said step.

7. A disk drive as claimed in claim 1, wherein said lifting means comprises a pushing ring interlocking with said moving means, and a plurality of pushing rods formed on said pushing ring such that said pushing rods pass through said holes of said turntable, for pushing said clamp up when said pushing ring is lifted by said moving means.

8. The disk drive as claimed in any preceding claim, wherein said moving means comprises a moving rod on which a sloped surface for contacting and lifting said lifting means is formed at one end and on which a protrusion for contacting and horizontally moving said disk moving portion is formed, and driving means for moving said moving rod.

9. A disk drive as claimed in claim 8, wherein said driving means comprises a rack formed on the side of said moving rod, a pinion engaged with said rack, and a motor for combining with said pinion and rotating said pinion.

10. A disk drive as claimed in claim 8 or claim 9, wherein said lifting means includes a pushing ring ascending and descending by sliding on said sloped surface, and pushing rods formed on said pushing ring, and wherein said pushing ring and said pushing rod are lifted as said moving means rectilinearly move and said pushing rod pushes said clamp to thereby release the disk, and said protrusion of said pushing rod moves said disk moving portion by a predetermined distance to correct the eccentricity of said disk.

11. A disk drive comprising:

a turntable attached to the shaft of a spindle motor installed on a base frame, for loading a disk thereon;

a clamp for securing the disk onto said turntable;

a disk moving portion for supporting the disk by being inserted into a center hole of the disk, and moving the disk by a predetermined distance in a horizontal direction with respect to the disk from the center of rotation of said turntable;

moving means for moving said disk moving portion by a predetermined distance.

12. A disk drive as claimed in claim 11, wherein said turntable has a plurality of holes symmetrically formed thereon, and said disk moving portion comprises a central ring interlocking with said moving means and moving

horizontally by a predetermined distance from the center of rotation of said turntable, and a plurality of protrusions formed on said central ring for supporting the disk by passing through said holes on said turntable and inserting into the center hole of the disk.

13. A disk drive as claimed in claim 12, wherein a magnet is installed on said protrusions for magnetically attracting said clamp and securing the disk onto said turntable.

14. A disk drive as claimed in claim 11 or claim 12, further comprising a ring for supporting said disk moving portion so that said moving portion can move by a predetermined distance on said turntable.

15. A disk drive as claimed in any one of claims 11-14, wherein said moving means comprises a lever hinged on the base frame at one end thereof by a hinge and a pivoting means installed at the other end of said lever, for pivoting said lever around said hinge, and said lever moves said disk moving portion horizontally.

16. The disk drive as claimed in claim 15, wherein said pivoting means comprises a rack formed at the edge opposite said hinge of said lever, a pinion engaged with said rack, and a motor for rotating said pinion.

17. A disk drive comprising means to support and drive a disk, and means to move the disk to correct a detected eccentricity in the tracks of the disk.

18. A disk drive according to claim 17, further comprising any one or more of the features of the

accompany description, claims, abstract and/or drawings, in any combination.

19. A disk drive substantially as described herein with reference to and as shown in Figures 3-9 or 10-13 of the accompanying drawings.